REMARKS/ARGUMENTS

Applicant acknowledges receipt of the Office Action dated December 9, 2004, in which the Examiner objected to claim 53, rejected claims 1-3, 10-11, 13, 18-22, 28-29, 31, 36-39, 45-46, 48 and 53-55 as obvious over Bugnion (US 6075938) in view of Derks (US 6810033 B2); and rejected claims 4-9, 12, 14-17, 23-27, 30, 32-35, 40-44, 47 and 49-52 as obvious over Bugnion (US 6075938) in view of Derks (US 6810033 B2) in combination with Bowman-Amuah (US 6697824).

Applicant thanks the Examiner for her thoroughness in preparing the Office Action. At the same time, Applicant respectfully submits that the rejections of the present claims must fail for the reasons set out below.

Status of the Claims

Independent claims 1, 20, 37, and 54 have been amended. Of the original dependent claims, only claim 53 has been amended. New claims 56-64 are added. Claims 1-64 are pending.

Rejections under 35 U.S.C. § 103(a)

In support of her rejection of claims 1-3, 10-11, 13, 18-22, 28-29, 31, 36-39, 45-46, 48 and 53-55 as obvious over Bugnion in view of Derks, the Examiner asserts that Bugnion teaches "providing one or more computer services for a plurality of customers, the apparatus comprising a real computer on which is set up of each of said customers [*sic*] at least one virtual machine for each of said customers." Applicant respectfully submits that this rejection is based on a fundamental misunderstanding on the part of the examiner as to what is claimed in the present application and what is disclosed in the cited art.

First, each independent claim in the present application requires a "virtual machine." In the context of the present invention, the term "virtual machine" is used to refer generally to the technology by which software is written and executed on a real computer in order to create a virtual computer on which an operating system runs. This is described in a number of places throughout the present specification and the examiner is referred particularly to the passage at page 17, line 25 to page 18, line 27 of the present description. Thus, in the sense used in the present specification, a virtual machine is a practically self-contained operating environment that behaves as if it is a separate computer, separately of the real or physical computer on which the software that generates the virtual machine is run.

In the context of the present invention, Bugnion discloses no more than an efficient piece of software for creating virtual machines. With respect to the present invention, Bugnion has no more relevance than any other software or other technology for creating virtual machines. The examiner will certainly know, and indeed the present specification states, that virtual machine technology per se is not new. Correspondingly, virtual machine monitors themselves are not new. As mentioned on for example page 17 of the present application and at column 2, lines 36 onwards of Bugnion, IBM developed virtual machine technology in the late 1960s and early 1970s. Bugnion was cited in the present application as filed and Applicant is confident that there is no disclosure nor suggestion of the present invention in Bugnion.

Specifically, Bugnion does not disclose providing one or more computer services for a plurality of customers, or setting up at the request of each of said customers at least one virtual machine for each of said customers, the at least one virtual machine for each of said customers having a specification specified by the respective customer (emphasis added). Nowhere does Bugnion disclose or suggest the concept of creating plural virtual machines on a real computer in which at least one virtual machine is set up for each of the customers, each of those virtual machines having a specification that is specified by the respective customer.

It appears that the examiner is equating the term "customer" in the claims of the present application with "applications" in the sense of "software applications" in Bugnion. Applicant respectfully submits that there is no basis for this comparison. In no sense can a "customer" be equated with or be considered to be analogous to a "software application." Contrary to the examiner's assertion, this is not a mere implementation detail, but rather goes to the heart of the present invention.

The principal problem that is addressed by the present invention is how to host or provide computer services (such as applications hosting services, web hosting services, etc., as detailed in the present application) for plural customers in a secure way while minimizing the real physical resources which are required. This is a significant and very real and current technical problem. At present, those who are providing such hosting services for third parties typically have very many real computers, with a respective real computer being dedicated to each customer. This has significant cost and maintenance implications for the provider, which inevitably results in relatively high costs being passed onto the customers. The present invention solves this technical

problem with a technical solution, namely the creation and use of plural virtual machines for the respective customers.

Bugnion does not disclose nor suggest using virtual machines in this manner. The examiner may know that, historically, virtual machines were used almost exclusively by computer scientists, especially when developing new software. The computer scientists would typically create a virtual machine on a real machine and use the virtual machine to develop and test new software (such as operating systems and software applications). Plural virtual machines might be set up, with each running different versions of the software. The main advantage of using the virtual machine rather than the real computer was that if the software being developed caused problems to the operating system running on the virtual machine or to the virtual machine itself, then only the virtual machine would "crash", and the underlying real computer would not be affected at all. Thus, computer scientists could safely develop new software without concern as to whether the new software might cause problems for the real computer. The examiner will immediately appreciate the inconvenience of a real computer crashing, owing to the delay in restarting the computer and the like and because of the possibility of serious and irrecoverable damage being caused to the real computer. In short, virtual machine technology was developed by and for computer scientists, were of very little interest to those working outside the field of computer science, and were principally of interest only to a few software developers and academics.

Thus, while the present invention makes use of technology that per se is old (i.e. virtual machine technology), the present invention uses that technology in a new and non-obvious way to enable persons to provide or host computer services for plural customers, thus providing a technical solution to this technical problem.

The virtual machines of the present invention can be isolated from each other so as to operate in a secure manner, so that for example one customer does not have any access to the applications or services being hosted for other customers even if they are running on the same physical computer. The use of plural virtual machines also provides for enormous efficiency in use of physical resources, such as real memory, real storage (such as hard disks or tape or the like), real CPUs, etc., because the physical resources can effectively be spread over plural customers. Moreover, if a customer's requirements change so that more storage, more memory, higher processing speed, etc., are required, this is easily accommodated by modifying the set-up of the

virtual machine and does not (normally) require that new physical apparatus be purchased by the operator of the real computer. This allows customers to have effective access to the latest processors, data storage devices, memory devices, etc. at relatively low cost as the cost of the real resources can effectively be spread across plural customers. Such advantages are amply described in the present application and the examiner is referred for example to the section from page 29, line 4 to page 31, line 19 of the present application.

The other main document cited by the examiner, Derks, does not even refer to virtual machines. This patent relates to what is referred to in the patent as "Private Virtual Networking", which is more commonly known as "virtual private networking" or "VPN", which relates solely making a secure transmission channel over an insecure network. This has nothing whatsoever to do with virtual machine technology. Even at the passages cited by the Examiner, Derks makes no teaching or disclosure of a virtual machine for each customer or of the virtual machine having a specification specified by the customer. Hence, the combination of Derks with Bugnion simply does not support the present obviousness rejection.

In order to clarify the aforementioned distinctions, each pending independent claim has been amended to require that the at least one virtual machine for each of the customers have a specification specified by and configurable by the respective customer. Support for this amendment can be found in several places in the specification, including for example page 16, lines 24 to 26 and page 26, lines 11 to 15 of the present application. The independent claims have also been amended to recite virtual machine(s) "having an operating system running thereon." This amendment is intended to clarify that the claims relate to virtual machine technology proper, as discussed above. Support for this amendment can be found at *inter alia* page 17, line 26 onwards.

For all of the foregoing reasons, it is respectfully submitted that the invention of each independent claim is patentable. Because the rejection of the independent claims must fail, the rejection of claims 4-9, 12, 14-17, 23-27, 30, 32-35, 40-44, 47 and 49-52 as obvious over Bugnion in view of Derks in combination with Bowman-Amuah must also fail.

New Claims

New dependent claims 56 to 64 have been added to specify further preferred details of virtual machine technology in the context of the present invention.

Claims 56, 59 and 62 refer to a virtual machine providing a virtual central processor unit, support for this amendment being found at *inter alia* page 18, lines 12 and13 and page 29, lines 11 to 14.

Claims 57, 60 and 63 refer to a virtual machine being created using a virtual machine abstraction program, support for this amendment being found at *inter alia* page 16, line 21.

Claims 58, 61 and 64 refer to a virtual machine being created using machine simulation/emulation software, support for this amendment being found at *inter alia* page 23, line18 to page 24, line 11.

Because they depend from allowable base claims, and because they set out further limitations that distinguish them over the art, new claims 56-64 are also allowable.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance. If the Examiner has any questions or comments, or otherwise feels it would be advantageous, he is encouraged to telephone the undersigned at (713) 238-8043.

Respectfully submitted,

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